IB MYP YEAR 5

ASSESSMENT TASK

Patterns in Probability

Subject:	Y10 ***Extended*** Mathematics	**Name :** **(Class)**	Sharon Law (Y10T)
Topic:	**Patterns in Probability**		
Date of assessment:	**Thursday 1st December (session 2)**		

- **This task assesses Criteria B and C**
- **Time allowed – *one hour***
- **Write your answers on the file paper provided. GDCs are allowed.**

ADVICE:

Read the criteria descriptors and task-specific clarifications carefully before you start your work. This will give you a clear understanding of what is required and what a high quality piece of work for this task must include. This way you give yourself the best chance of achieving the highest levels in this task.

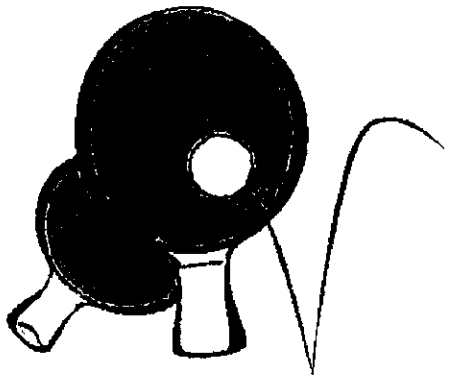
Criterion B

Levels	Task-Specific Rubric	Official IB Descriptors
0	The student does not reach a standard described by any of the descriptors given below.	
1-2	You are able to answer the early questions, and order your answers in a way that reveals patterns.	The student **applies, with some guidance,** mathematical problem-solving techniques to recognize simple patterns.
3-4	You develop appropriate systematic methods in order to answer the questions. The results you get help you to suggest a mathematical rule using a,b and N	The student **applies** mathematical problem-solving techniques to recognize patterns, **and suggests** relationships or general rules.
5-6	You continue with the questions, and use questions 6 and 7 as a check on your findings.	The student **selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, and **draws conclusions** consistent with findings.
7-8	You are able to justify or prove your answer to question 6.	The student **selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, draws the **correct conclusions** consistent with findings, and **provides justifications or a proof.**

Criterion C

Levels	Task-Specific Rubric	Official IB Descriptors
0	The student does not reach a standard described by any of the descriptors given below.	
1-2	The narrative is basic. Mathematical symbols are used, perhaps with ***some*** errors or inconsistencies.	The student shows **basic use** of mathematical language and/or forms of mathematical representation. The lines of reasoning are **difficult to follow.**
3-4	The narrative is reasonably easy to follow. Mathematical language is used in a generally accurate way. Mathematical notation is used with few errors.	The student shows **sufficient use** of mathematical language and forms of mathematical representation. The lines of reasoning are **clear though not always logical or complete.** The student moves between different forms of representation with **some success.**
5-6	The narrative is easy to follow. Mathematical arguments are presented logically. Mathematical vocabulary and notation are used accurately and appropriately.	The student shows **good** use of mathematical language **and** forms of mathematical representation. The lines of reasoning are **concise, logical** and **complete.** The student moves **effectively** between different forms of representation.

Patterns in Probability



I play table tennis against a friend. The probability I win a point is ***a*** and the probability she wins a point is ***b***. These probabilities stay constant throughout the game.
(Note: $a \neq b$)

A game is won only when a player wins two consecutive points.

So, for example, I might win a game where the point rallies go: WLWLWLWLWW (that is, I win the game because I won the final 2 points).

In the following, simplify your answers wherever possible.

1. Write a simple relationship between a and b.

2. What is the probability I win the first two points (and so win the game)?

3. What is the probability the game lasts for 3 points and I win?

4. What is the probability the game lasts for 4 points and I win?

(You may like to repeat question 4 for when the game lasts for 5 points, or 6, or 7 and so on.)

5. Describe mathematically any patterns you find in these probabilities.

6. What is the probability, in terms of a and b, that the game lasts for N points and I win?

7. If a = 0.6, show that the probability I win a game in 5 points or less is approximately 0.625.

8. Write a ***proof*** or ***justification*** of your answer to question 6.

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1. The points a & b will determine the competitors win or lose. The points will keep counting until the game end.

Q2. P(two points)
= ~~P($\frac{1}{2}\times\frac{1}{2}$)~~ P($W_1W_2$) + P($W_2W_1$)
= P($\frac{1}{2}\times\frac{1}{2}$) + ($\frac{1}{2}\times\frac{1}{2}$)
= $\frac{1}{4}+\frac{1}{4}=\frac{2}{4}=\frac{1}{2}$ //

→ 2) P(2 points)
P($\frac{1}{2}\times\frac{1}{2}$)
= P($\frac{1}{4}$) //

3 P(3 points)
P(LW.W_2) + P(LW_2W)
P($\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$) + P($\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$)
= P($\frac{1}{8}$) + P($\frac{1}{8}$)
= P($\frac{2}{8}$) = P($\frac{1}{4}$)

→ 3) P(3 points)
P(LWW)
= P($\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$)
= P($\frac{1}{8}$) //

4 P(4 points)
P(LLWW) + P(WLWW)
= P($\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$) + P($\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$)
= P($\frac{1}{16}$) + P($\frac{1}{16}$)
= P($\frac{2}{16}$) = P = $\frac{1}{8}$ //

P(5 points)
= P(LWLWW) + P(~~WLLWL~~ WLLWW) + P(LLLWW)
= P($\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$) + P($\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$) + P($\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$)
= P($\frac{1}{32}$) + P($\frac{1}{32}$) + P($\frac{1}{32}$)
= P($\frac{3}{32}$) //

P (6 points)

~~P(LWLLWW~~

= P(LWLLWW) + P(WLLLWW) + P(WLWLWW) + P(LLLLWW)

~~+ P(LLWLLW~~ : $P(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}) + P(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}) + P(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2})$

$+ P(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2})$

$= P(\frac{1}{64}) + P(\frac{1}{64}) + P(\frac{1}{64}) + P(\frac{1}{64})$

$= P(\frac{4}{64}) = P(\frac{1}{16})$,

P(7 points)

= P(LWLWLWW) + P(WLLLLWW) + P(WLWLLWW) + P(LLLLLWW)

$= P(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}) + P(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2})$

$+ P(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}) + P(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2})$

~~= P(LLWW)~~ $= P(\frac{1}{128}) + P(\frac{1}{128}) + P(\frac{1}{128}) + P(\frac{1}{128})$

$= P(\frac{4}{128}) = P(\frac{1}{32})$,

5) 2 points = $\frac{1}{4} = \frac{1}{2^2}$

3 points = $\frac{1}{8} = \frac{1}{2^3}$

4 points = $\frac{1}{8} = \frac{1}{2^3}$

5 points = $\frac{3}{32} = \frac{3}{2^5}$

6 points = $\frac{1}{16} = \frac{1}{2^4}$

7 points = $\frac{1}{32} = \frac{1}{2^5}$

N points = $\frac{1}{n} = \frac{1}{2^n}$.

6) $(\frac{1}{2})^n \times (\frac{1}{2})^n = \frac{1}{2}n$ the probability is $\frac{1}{8}$

$\frac{n}{2} \times \frac{n}{2} = \frac{1}{2^n}$

$\frac{2n}{4} = \frac{1}{2^n}$

$\frac{2n\times 2^n}{4} = 1$

$2n\times 2^n = 4$

$2(n\times 1^n) = 4$

$n\times 1^n = 2$

$n = \frac{1}{6}$

$n = \frac{1}{2^3}$

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7) $\frac{1}{n} = \frac{6}{10}$

$\frac{1}{n} \times 10 = 6$

$\frac{10}{n} = 6$

$10 = 6n$

$\frac{10}{6} = n$

$\frac{5}{3} = n$

$n = \frac{5}{3}$

↳ $0.6 = \frac{1}{2}n$.

$\frac{6}{10} = \frac{1}{2}n$.

$\frac{3}{5} = \frac{1}{2}n$.

Probability of 5 points $= \frac{3}{32}$

$= 0.09375$

$n = 5$

$n \times 625 = \frac{5}{5}$

8 In Q.3 the probability of 3 points is $\frac{1}{8}$ and now I calculate n points probability is $\frac{1}{8}$ so I think n points is equal 3
